

Those skilled in the art will, of course, appreciate that other attributes can be used, in addition and/or instead of the foregoing, to define the policy for each host. Moreover, though the discussion below is primarily focused on definition and application of attributes (and, thereby, policies) for hosts, these teachings are applicable, as well, toward definition of policies for other SAN components, such as storage units (or LUNs) 14, as well as for interconnect elements 16.

Policy attributes for the hosts 12 are defined by default and/or by the operator/ administrator, as discussed below in the section entitled “Display And Management Of A Policy Hierarchy.”

Those attributes can be defaulted and/or assigned on a host-by-host basis. However, they can also be inherited from attributes assigned (by default and/or the operator/administrator) to any of several hierarchical groupings in which each host, group of hosts, or file systems belongs, so as to facilitate the definition and application of uniform policies among the hosts 12 (or other SAN components).

In the illustrated embodiment those hierarchical groupings are, proceeding from highest to lowest: (i) domain level or default policy; (ii) host group policy; (iii) host policy, and (iv) file system policy. The domain level is the root node in the policy hierarchy and establishes the default attributes for all hosts 12 in the SAN. The host group policy defines policy attributes for each host group, of which there can be zero, one or more – as defined by default (e.g., based on host type, location, or other characteristics) or by the operator/administrator. The host policy defines the policy attributes for a give host and, by default, applies to all of its file systems. A file system policy defines attributes of each file system maintained by a host. In alternate

embodiments, greater or fewer hierarchical groups can be employed, as can groupings other than or in addition to those listed here.

In the illustrated embodiment, policy attributes not defined at a specific level in the hierarchy are
5 inherited. Thus, each file system inherits the policy attributes of the host in which it (the file system) resides, except for those attributes defined for that file system. Each host, in turn, inherits policy attributes of the host group in which it resides, except for those attributes defined for that particular host. Each host group, moreover, inherits policy attributes for the domain level, except for those attributes defined for that particular host.

10 FIGURE 33 illustrates an example of a policy hierarchy 240 utilized in the SAN manager 20 in accordance with an embodiment of the present invention. The SAN domain 242 is the root level of the policy hierarchy, and contains a set of parameters 244 that represent a fixed set of policy attributes that are inherited by lower levels in the policy hierarchy 240, unless overridden at
15 those levels.

Illustrated attributes 244 include a monitor flag, extend flag, threshold value, LUN group, extension minimum size, extension maximum size, max file system size, and alert interval, all as defined above. Though as noted above other attributes can be used in addition or instead.
20 Sample values for these parameters are shown in parenthesis. For example, in the illustration a default value for the monitor and extend flags is “on”; a default threshold value is 90% and so forth.

Host group 246 defines a policy for two hosts 250, 254. A threshold value 248 is established for this group that overrides the default threshold value 244 that was defined at the domain level 242. Therefore, both hosts 250, 254, and the file system 258 will inherit the new threshold value 248 rather than the default attribute 244.

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In the illustration, host 250 itself has a policy attribute that overrides the default LUN group attribute 244: here, specifying that any file system extension will utilize a LUN from the RAID1 group 252. In addition to the selected LUN group 252, the attributes pertaining to the first host 250 include the threshold value 248 defined by the host group 246, and all other default attributes 244 defined in the SAN domain 242. The manager 20 utilizes these attributes when extending a file system associated with the first host 250.

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The second host 254 overrides the extend flag default 244 by setting a new value 256. The host 254 also inherits the threshold value 248 from the host group 246. All of the other policy attributes associated with the host 254 are inherited from the established defaults 244 set in the SAN domain 242. The manager 20 to extend file systems associated with the second host 254 utilizes these policy attributes.

A policy is also created on the second host 254 for file system 258. Attribute values are 20 explicitly set for the extend flag 260, max file system size 262, and the alert interval 264. The file system 258 therefore does not inherit the extend flag value 256 that was set by the second host 254, because the explicit setting of the extend flag 260 overrides the earlier setting 256. The remaining attributes are inherited from the defaults 244 set in the SAN domain 242.